SYSTEMS AND METHODS FOR ACCESSING AN INTERVERTEBRAL DISC SPACE IN A BODY OF A PATIENT

TECHNICAL FIELD

In various embodiments, the present invention relates to systems and methods for accessing an intervertebral disc space in a body of a patient.

BACKGROUND

Fusion surgery can be a viable treatment option for reducing pain and improving function in patients who suffer from chronic lower back pain. In the past, several open and minimally invasive lumbar fusion approaches have been employed by spine surgeons, including anterior lumbar interbody fusion, posterior lumbar interbody fusion, and transforaminal lumbar interbody fusion. Unfortunately, anterior lumbar interbody fusion can endanger major organs and blood vessels, while posterior lumbar interbody fusion and transforaminal lumbar interbody fusion can cause musculoligamentous injury, nerve root injury, and spinal fluid leakage.

To avoid the risks of these injuries, minimally invasive lateral approaches (e.g., a retroperitoneal transpsoas approach) to the lumbar spine have been developed and employed in order to access the intervertebral disc space. One complication to existing lateral approaches, however, is the risk of injuring surrounding nerves, such as those in the lumbar plexus nerve group, which can result in postsurgical motor and sensory deficits (e.g., thigh pain and/or weakness) for the patient. In fact, the wide variability in lumbar plexus anatomy complicates the identification of a safe working zone.

Neuromonitoring may be employed during a lateral approach in an attempt to help identify and avoid surrounding nerves; however, neuromonitoring suffers from its own drawbacks. For example, neuromonitoring can be inaccurate when employed on its own and may lead to a false negative (i.e., falsely indicate that no surrounding nerves are present in the region being accessed), thereby giving the surgeon a false sense of security. Neuromonitoring, moreover, is generally considered to be unreliable. It is not a guarantee against injury, and there is generally no clinical data showing that it prevents injury. In addition, neuromonitoring is time consuming and expensive (both because of the added cost of the neuromonitoring equipment itself and because neuromonitoring complicates and lengthens the surgical procedure). Neuromonitoring is also infeasible if a patient has been temporarily paralyzed and, thus, it inhibits the use of muscle relaxants. Not being able to use muscle relaxants, however, makes fusion surgery more difficult, as the patient's muscles will naturally fight the surgeon's attempt to access, via a channel through those muscles, the lumbar spine.

Another shortcoming to existing lateral approaches to the lumbar spine is the inherent risk of inadvertently closing the access or working channel during the surgical procedure. In particular, the dissecting retractors employed in current procedures to dissect the patient's tissue (e.g., handheld Deaver retractors) are typically removed from the patient's body during the surgery and replaced by self-retaining, expandable retractors that aid in creating the working channel. The process of removing the dissecting retractors and replacing them with self-retaining, expandable retractors often, and disadvantageously, leads to a loss of the established access channel. Repeated dissection is therefore often needed in order to re-establish the access channel, which puts the patient at an increased risk of damage to associated structures. Having to re-establish the access channel also leads to further risk of damage to the patient's neural elements and increased time in the operating room.

Accordingly, there is a need to improve existing lateral approaches to the lumbar spine and, consequently, to develop new surgical tools that facilitate those improved approaches.

SUMMARY OF THE INVENTION

In various embodiments, the present invention features a lateral approach for lumbar interbody fusion that allows for direct visualization of the psoas muscle and surrounding nerves. The direct visualization of the psoas muscle, together with a manual palpation thereof by the surgeon, leads to improved patient safety. In particular, the technique described herein allows the surgeon to identify and avoid the region in the psoas muscle containing the lumbar plexus nerve group, optionally without any neuromonitoring.

In addition, in various embodiments of the present invention, the dissecting retractors that are employed in dissecting the patient's tissue (e.g., the psoas muscle) in order to gain access to the intervertebral disc space convert to self-retaining, expandable retractors that may be manipulated to create the working channel in the patient's body. In other words, the need to remove the dissecting retractors from the patient's body during the surgery and replace them with separate self-retaining, expandable retractors is obviated. Advantageously, this avoids the risk of access or working channel closure during the surgery and the downfalls associated therewith.

In general, in one aspect, embodiments of the invention feature a method for accessing an intervertebral disc space in a body of a patient. The method involves making an incision in a region of the patient's body that permits access to the psoas muscle, directing a blade of a first dissecting retractor through the incision and such that a distal end of the first dissecting retractor blade is positioned proximate the intervertebral disc space, and directing, independently of the first dissecting retractor blade, a blade of a second dissecting retractor through the incision and such that a distal end of the second dissecting retractor blade is positioned proximate the intervertebral disc space. During their placement within the patient's body, the first and second dissecting retractor blades are employed in a tissue dissection process in order to gain access to the intervertebral disc space, and, following the positioning of the distal ends of the first and second dissecting retractor blades proximate the intervertebral disc space, the first and second dissecting retractors are coupled to one another.

In various embodiments, the method further involves manually palpating the psoas muscle subsequent to making the incision in the region of the patient's body. The first dissecting retractor blade may be directed anterior to, or through, the psoas muscle. For its part, the second dissecting retractor blade may be positioned posterior to the first dissecting retractor blade. In general, the first and second dissecting retractor blades are both directed to avoid a region in the psoas muscle comprising a lumbar plexus nerve group.

In one embodiment, coupling the first and second dissecting retractors to one another involves coupling a retractor stabilizing frame to both the first and second dissecting retractors. Subsequently, a handle may be removed from each of the first and second dissecting retractors. In addition, a stabilizing arm may be coupled to the retractor stabilizing frame and to a rigid structure, such as an operating table. In one embodiment, the retractor stabilizing frame includes a